Vol. 36 (1995) REPORTS ON MATHEMATICAL PHYSICS No. 1

GRAVITY WAVES AND SYMMETRY OF BOUNDARY PHENOMENA IN RELATIVISTIC GASEOUS SYSTEMS

A. B. BALAKIN and A. L. TRONDIN

Department of General Relativity and Gravitation, Laboratory of Gravitational Wave Astronomy, Kazan State University, Lenin str 18, 420008, Kazan, Russia (e-mail: balakin@astro.kazan.su)

(*Received November 4, 1994*)

The problem of mathematical description of the interrelation between external and internal symmetry of a relativistic bounded kinetic system and its dynamical and informational characteristics is discussed.

The concept of gravitationally-induced removal of degeneracy with respect to latent parameters of the contact interaction is illustrated on the examples of exactly integrable phenomenological models of evolution of relativistic bounded gaseous systems.

1. Introduction

The groundwork for the phenomenological approach to the mathematical and physical modelling of the gas behaviour near a rigid wall was laid by J. C. Maxwell [1], who suggested a specular-diffuse model of the particle reflection from the boundary.

Further development of the fundamental and applied aspects of aero-hydrodynamics and plasma kinetics gave impetus to the raise of the pronounced interest to this problem (see, for example, [2, 3, 4] and references herein). The mathematical generalization of phenomenological approach resulted in presentation of the laws of particle reflection from the boundary in terms of integral equations formalism [5, 6]. This formalism was found to be the most suitable one for covariant generalization, so that following the phenomenological approach of T. Koga [3], the authors of this paper have solved a number of kinetic problems of bounded relativistic gas in the field of gravitational radiation [7–10]. These investigations have shown the character of nonequilibrium processes induced by gravitational radiation field in the boundary layer to be essentially dependent on external and internal symmetry of the problem, in particular:

- on the arrangement of boundaries with reference to the gravitational radiation front plane;
- on the presence of anisotropy or nonhomogeneity of gas distribution at the gravitational radiation front plane;
- on the presence or absence of latent nonequivalence of gas reflection laws from the opposite boundaries.